

(d) CO₂, N₂O, and CH₄ emissions from each stationary fuel combustion unit other than lime kilns. You must report these emissions under 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

(e) CO₂ collected and transferred off site under 40 CFR part 98, following the requirements of subpart PP of this part (Suppliers of Carbon Dioxide (CO₂)).

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You must calculate and report the annual process CO₂ emissions from all lime kilns combined using the procedure in paragraphs (a) and (b) of this section.

(a) If all lime kilns meet the conditions specified in § 98.33(b)(4)(ii) or (b)(4)(iii), you must calculate and report under this subpart the combined process and combustion CO₂ emissions by operating and maintaining a CEMS to measure CO₂ emissions according to the Tier 4 Calculation Methodology specified in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) If CEMS are not required to be used to determine CO₂ emissions from all lime kilns under paragraph (a) of this section, then you must calculate and report the process and combustion CO₂ emissions from the lime kilns by using the procedures in either paragraph (b)(1) or (b)(2) of this section.

(1) Calculate and report under this subpart the combined process and combustion CO₂ emissions by operating and maintaining a CEMS to measure CO₂ emissions from all lime kilns according to the Tier 4 Calculation Methodology specified in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(2) Calculate and report process and combustion CO₂ emissions separately using the procedures specified in paragraphs (b)(2)(i) through (b)(2)(v) of this section.

(i) You must calculate a monthly emission factor for each type of lime produced using Equation S-1 of this section. Calcium oxide and magnesium oxide content must be analyzed monthly for each lime product type that is produced:

$$EF_{LIME,i,n} = \left[(SR_{CaO} * CaO_{i,n}) + (SR_{MgO} * MgO_{i,n}) \right] * \frac{2000}{2205} \quad (\text{Eq. S-1})$$

Where:

EF_{LIME,i,n} = Emission factor for lime type i, for month n (metric tons CO₂/ton lime).

SR_{CaO} = Stoichiometric ratio of CO₂ and CaO for calcium carbonate [see Table S-1 of this subpart] (metric tons CO₂/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO₂ and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO₂/metric tons MgO).

CaO_{i,n} = Calcium oxide content for lime type i, for month n, determined according to

§ 98.194(c) (metric tons CaO/metric ton lime).

MgO_{i,n} = Magnesium oxide content for lime type i, for month n, determined according to § 98.194(c) (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for tons to metric tons.

(ii) You must calculate a monthly emission factor for each type of calcined byproduct/waste sold (including lime kiln dust) using Equation S-2 of this section:

$$EF_{LKD,i,n} = \left[(SR_{CaO} * CaO_{LKD,i,n}) + (SR_{MgO} * MgO_{LKD,i,n}) \right] * \frac{2000}{2205} \quad (\text{Eq. S-2})$$

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Where:

$EF_{LKD,i,n}$ = Emission factor for calcined lime byproduct/waste type i sold, for month n (metric tons CO₂/ton lime byproduct).

SR_{CaO} = Stoichiometric ratio of CO₂ and CaO for calcium carbonate (see Table S-1 of this subpart) (metric tons CO₂/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO₂ and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO₂/metric tons MgO).

$CaO_{LKD,i,n}$ = Calcium oxide content for calcined lime byproduct/waste type i

sold, for month n (metric tons CaO/metric ton lime).

$MgO_{LKD,i,n}$ = Magnesium oxide content for calcined lime byproduct/waste type i sold, for month n (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for tons to metric tons.

(iii) You must calculate the annual CO₂ emissions from each type of calcined byproduct/waste that is not sold (including lime kiln dust and scrubber sludge) using Equation S-3 of this section:

$$E_{waste,i} = \left[(SR_{CaO} * CaO_{waste,i}) + (SR_{MgO} * MgO_{waste,i}) \right] * M_{waste,i} * \frac{2000}{2205} \quad (\text{Eq. S-3})$$

Where:

$E_{waste,i}$ = Annual CO₂ emissions for calcined lime byproduct/waste type i that is not sold (metric tons CO₂).

SR_{CaO} = Stoichiometric ratio of CO₂ and CaO for calcium carbonate (see Table S-1 of this subpart) (metric tons CO₂/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO₂ and MgO for magnesium carbonate (See Table S-1 of this subpart) (metric tons CO₂/metric tons MgO).

$CaO_{waste,i}$ = Calcium oxide content for calcined lime byproduct/waste type i

that is not sold (metric tons CaO/metric ton lime).

$MgO_{waste,i}$ = Magnesium oxide content for calcined lime byproduct/waste type i that is not sold (metric tons MgO/metric ton lime).

$M_{waste,i}$ = Annual weight or mass of calcined byproducts/wastes for lime type i that is not sold (tons).

2000/2205 = Conversion factor for tons to metric tons.

(iv) You must calculate annual CO₂ process emissions for all kilns using Equation S-4 of this section:

$$E_{CO_2} = \sum_{i=1}^t \sum_{n=1}^{12} (EF_{LIME,i,n} * M_{LIME,i,n}) + \sum_{i=1}^b \sum_{n=1}^{12} EF_{LKD,i,n} * M_{LKD,i,n} + \sum_{i=1}^z E_{waste,i} \quad (\text{Eq. S-4})$$

Where:

E_{CO_2} = Annual CO₂ process emissions from lime production from all kilns (metric tons/year).

$EF_{LIME,i,n}$ = Emission factor for lime type i produced, in calendar month n (metric tons CO₂/ton lime) from Equation S-1 of this section.

$M_{LIME,i,n}$ = Weight or mass of lime type i produced in calendar month n (tons).

$EF_{LKD,i,n}$ = Emission factor of calcined byproducts/wastes sold for lime type i in calendar month n, (metric tons CO₂/ton byproduct/waste) from Equation S-2 of this section.

$M_{LKD,i,n}$ = Monthly weight or mass of calcined byproducts/waste sold (such as lime kiln dust, LKD) for lime type i in calendar month n (tons).

$E_{waste,i}$ = Annual CO₂ emissions for calcined lime byproduct/waste type i that is not sold (metric tons CO₂) from Equation S-3 of this section.

t = Number of lime types produced

b = Number of calcined byproducts/wastes that are sold

z = Number of calcined byproducts/wastes that are not sold

(v) Calculate and report under subpart C of this part (General Stationary Fuel Combustion Sources) the combustion CO₂ emissions from each lime kiln according to the applicable requirements in subpart C.

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